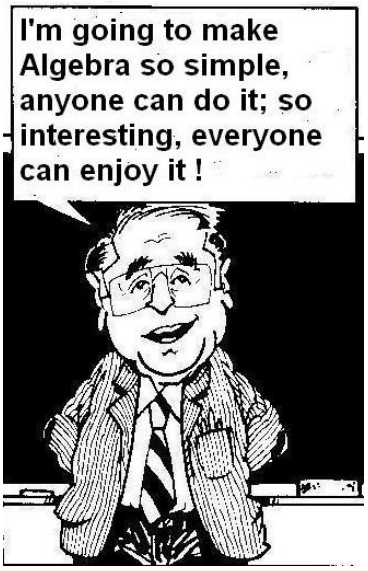
Unit #5

Introduction To Algebra. The Integers

Professor Weissman's Algebra Classroom



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How is Algebra Different From Arithmetic?

There are two major differences between Algebra and Arithmetic. In Algebra we use letters for numbers but, a lot more so than in Arithmetic. Also, in Algebra we use negative numbers. We'll talk about these negative numbers later. The letters we use in Algebra are called '**variables**,' and the take the place of numbers. For example, in Arithmetic we talk about adding 2 specific numbers like 7 and 5. In Algebra we talk about adding any two numbers like x and y.

Inside this issue:

Why Is Algebra So Hard?

Algebra will be hard only if you have difficulty with the skills needed to learn the **Language of Algebra**. If you can't do basic Math, Algebra, will in fact be impossible! You need to know the basic addition and multiplication tables, understand fractions and decimals. It won't hurt if you can do some Math 'in your head.'

How Is Algebra A Language?

Like English, or any other language, Algebra has a structure of its own. English has nouns and pronouns, Algebra uses numbers and variables. English has phrases and sentences. Algebra has expressions and equations. In fact, your success with Algebra will depend on how well you can translate from English to Algebra.

Why Study Algebra?

There are many jobs that require the use of Algebra concepts. If you can't do Algebra you can forget about those jobs. Even so, the reasoning skills that Algebra will provide will be beneficial in all aspects of life. With Algebra, you can develop a process for problem solving that will assist you in buying a car, a home, etc. You do math exercises, so that you can improve your ability to think logically, so that you can be a better lawyer, doctor, architect, prison warden or parent In sum, Algebra trains you to think and reason in a logical and orderly manner.

What Is The Set Of Integers?

The set of Integers includes the Negative whole numbers. All of our previous whole numbers, like 1,2,3,4,5 ,... will now have a plus sign attached to them to emphasize that they are different from their corresponding and opposite Negative whole numbers, -1,-2,-3,-4, - 5, ...

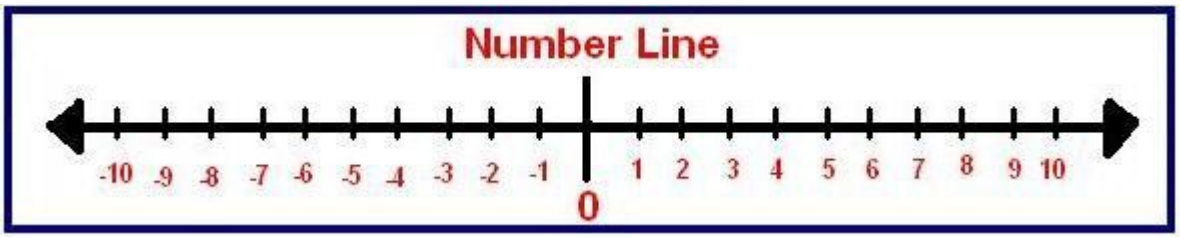
In a previous lesson we said that Subtraction is not Commutative. Again, that means, that the order of the 2 numbers being subtracted is important.

$$10\text{-}7 \neq 7\text{-}10$$

10-7=3. However, 7-10 can not be done in Arithmetic because the first number must be the larger. We will soon see that 7-10= - 3, a Negative number.

The set of Integers, called I, looks like this:

I = { ... , -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5. ...}



Where Are The Negative Integers On The Number Line?

All of the Negative Integers are to the left of zero. All of the integers on the right of zero are positive. We need not use the + signs with the Positives. However, usually for clarity, emphasis or to make a problem easier to solve, we use the + symbols.

How Are Signed Numbers Different From Arithmetic Numbers?

In Algebra, each number has two parts to it. Each number (except zero) has a sign, positive or negative, and a magnitude.

In Arithmetic, numbers only had magnitude.

The sign tells us the direction and the number answers the question "How much?"

Here are some types of direction the sign might indicate:

- right or left
- up or down
- win or lose
- east or west
- North or south
- deposit or withdrawal

For examples:

- Win $50 would be +50, lose –50
- Travel South 12 miles would be –12, North would be +12

NSD Volume Actives		NASD
Symbol	Las	NYSE
Microsoft Cp	27.09	AMEX
Nasdaq 100	39.65	TSX
Sirius Satellite	7.87	TSXV
Intel Cp	23.48	OCTB
Cisco Sys Inc	19.41 41 0.2	

A down arrow says the stock lost value. An up arrow says it increased in value.

What Does Absolute Value Mean?

Absolute Value means that the direction or sign is not important, only the magnitude is.

If we want to show the Absolute Value of a negative number like –15, we enclose it between 2 vertical lines like this: |-15|. The absolute value is 15

|-15| = 15

What we did, in effect, was to 'drop' the negative sign.

If we want to show the Absolute Value of a positive number like +15, we enclose it between 2 vertical lines like this: |+15|. Its absolute value is also 15

|+15| = 15

It looks like we also 'dropped' the sign.

The rule is that the absolute value of any number (except zero) is always positive.

Suppose one student needs to travel 15 miles North to get to school and a second student needs to travel 15 miles South to get to school. We would write these numbers as:

+15 and –15

If we are not concerned about their directions we would be looking for the absolute values.

|+15| and |–15|

15 = 15

Both absolute values are equal to 15.

Both students travel 15 miles to school.

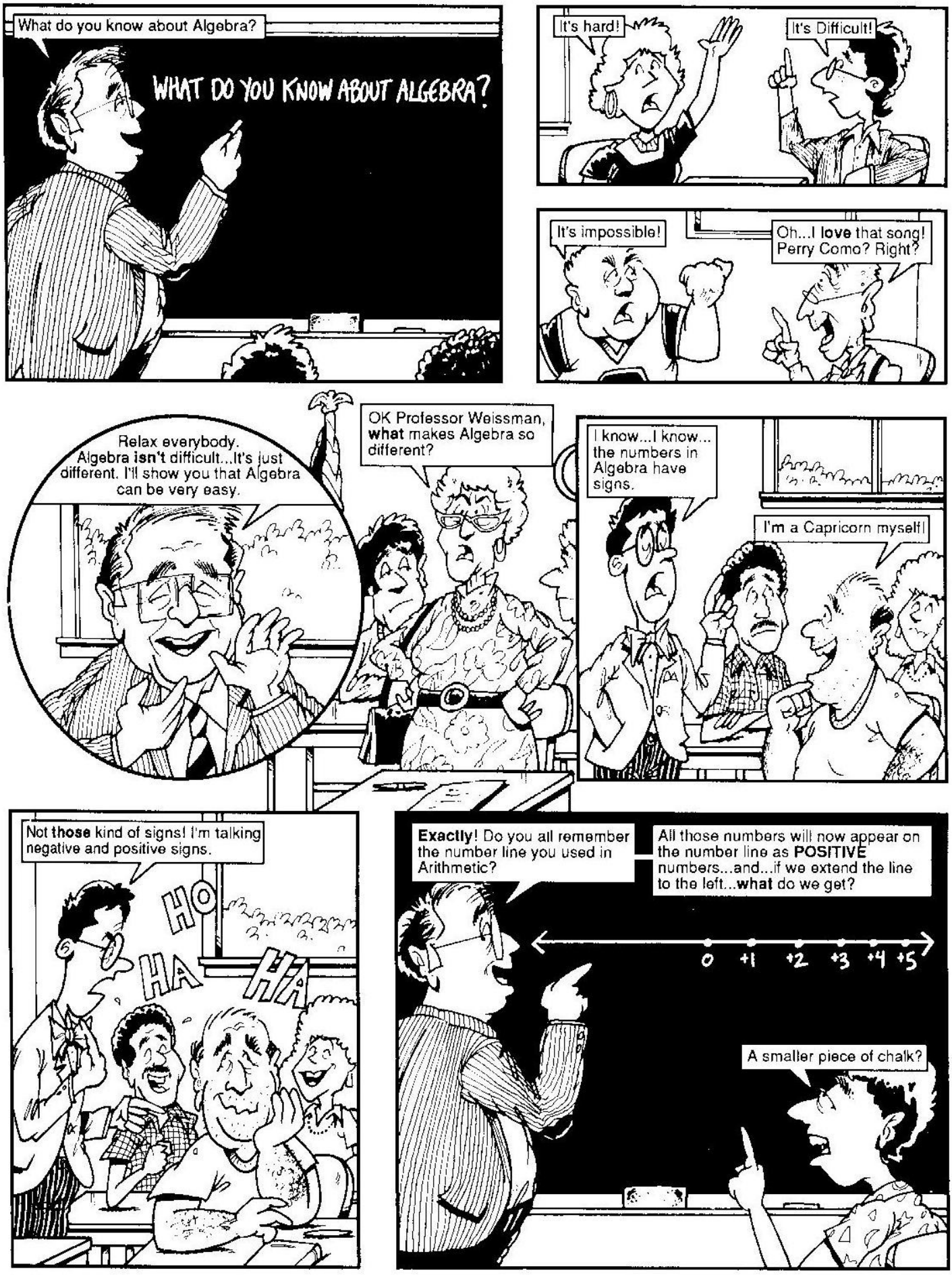
Most Active Stock Watch

Sym.	Last	Change	Vol.($M)
SPY	116.77	1.23 (1.06%)	2043.0
QQQ	37.18	0.32 (0.87%)	1860.1
MSFT	62.10	0.88 (1.44%)	1626.2
MRK	59.83	-3.61 (-5.69%)	1317.1
INTC	31.68	0.71 (2.29%)	1247.3
ORCL	12.86	-0.58 (-4.32%)	1183.7
GE	40.00	-0.41 (-1.01%)	1020.2
DIA	105.97	0.75 (0.71%)	995.0
IBM	107.36	0.76 (0.71%)	975.2
PFE	41.32	1.37 (3.43%)	818.2

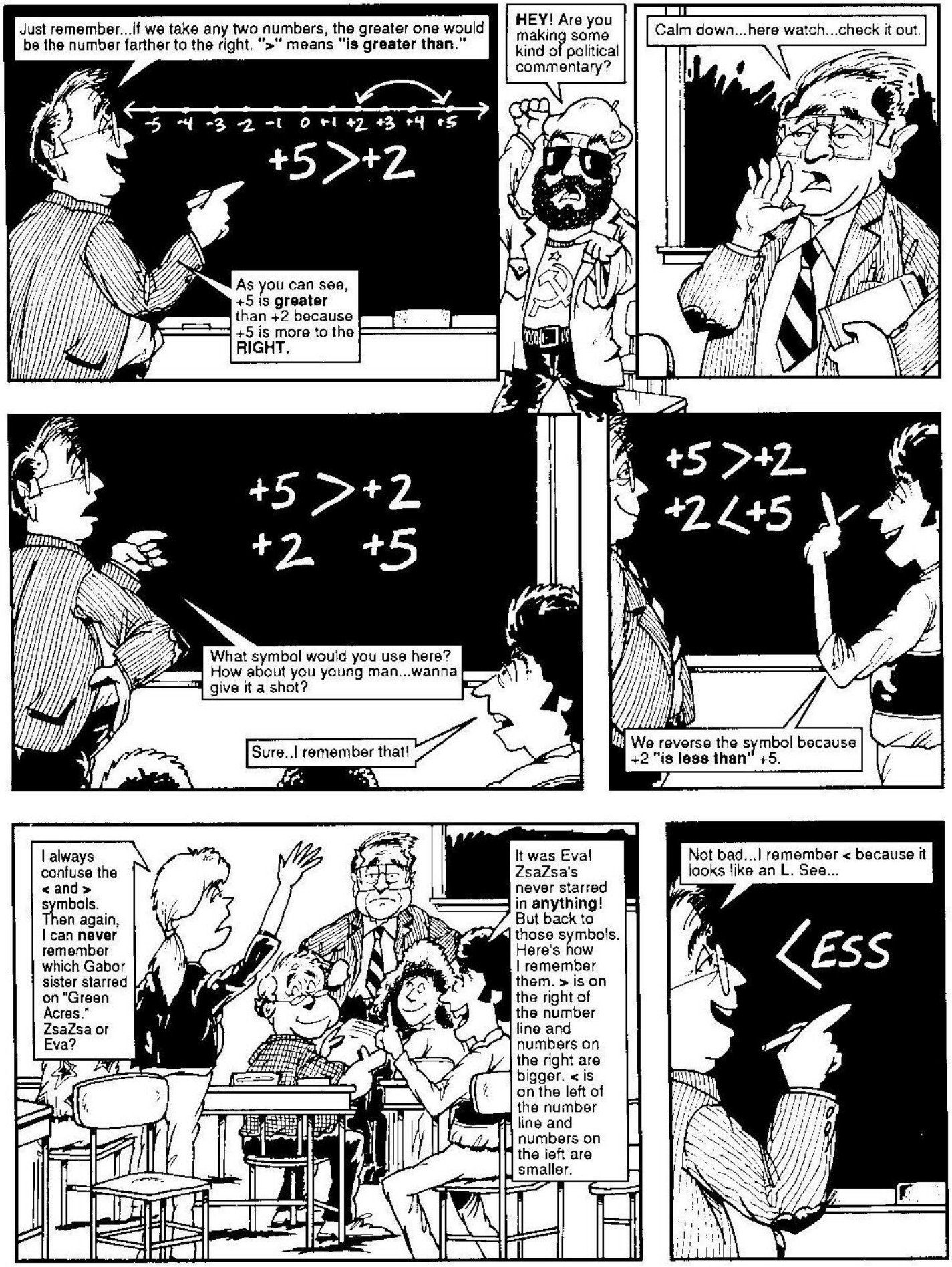
A more traditional way to show whether a stock finished the day up or down is to use positive and negative numbers.

A business that is losing money may be said to be "two million dollars *in the red*," while a business making a profit may be said to be two million dolllars *in the black*"

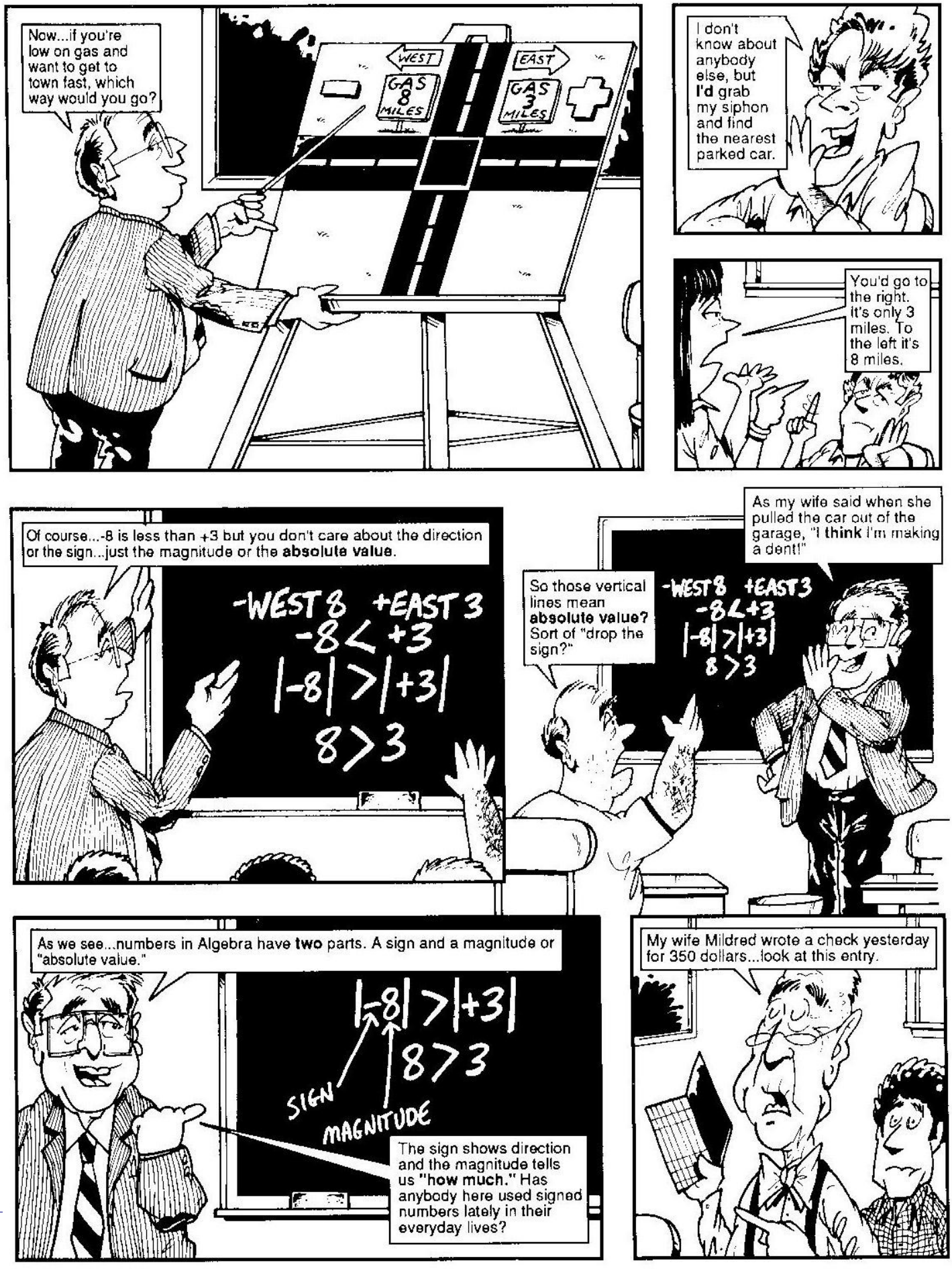
– **A** gambler who is winning is said to be "*ahead of the game*," while a gambler that is losing is "*in the hole*."


What do you know about Algebra?
WHAT DO YOU KNOW ABOUT ALGEBRA?
It's hard!
It's Difficult!
It's impossible!
Oh...I **love** that song! Perry Como? Right?
Relax everybody. Algebra **isn't** difficult...It's just different. I'll show you that Algebra can be very easy.
OK Professor Weissman, **what** makes Algebra so different?
I know...I know... the numbers in Algebra have signs.
I'm a Capricorn myself!
Not **those** kind of signs! I'm talking negative and positive signs.
HO
HA
HA
Exactly! Do you all remember the number line you used in Arithmetic?
All those numbers will now appear on the number line as **POSITIVE** numbers...and...if we extend the line to the left...**what** do we get?
0 +1 +2 +3 +4 +5
A smaller piece of chalk?


Well besides that...if we extend the line to the left we include **NEGATIVES**.
-5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5
THE INTEGERS
The positive and negative whole numbers as well as the zero make up what we call "**THE INTEGERS.**"
Can anybody give us an example where positives & negatives occur in the real world?
How about a weather thermometer? Right?
Sometimes you see them on signs. On my last vacation I saw a sign that read "1200 feet below sea level." **That's -1200!**
Good examples. You might not have noticed it yet but I'm on a diet and have lost 5 pounds so far! **That's -5!**
PAT PAT
YOU'RE RIGHT! We haven't noticed it yet!
What about the stock market reports Professor? According to today's newspaper, Magnum Corporation is +4, but General Industrial is -35!
DID YOU HAVE TO REMIND ME OF THAT?
O.K. class...let's talk about ordering now!
ALRIGHT! I'll have a pastrami on rye, hold the mayo with a side order of fries...
Sorry my hungry friend but we're all out of that. Besides, I was referring to ordering the **NUMBERS!**
RATS!
We're all out of **those** also! Who can write these numbers in order from lowest to highest?
+6, -3, -1, +2, 0
That's easy! I start with the most negative and continue to the most positive.
+6, -3, -1, +2, 0
-3, -1, 0, +2, +6
Great! We're ready for comparing numbers.


Just remember...if we take any two numbers, the greater one would be the number farther to the right. ">" means "is greater than."
-5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5
+5>+2
As you can see, +5 is greater than +2 because +5 is more to the RIGHT.
HEY! Are you making some kind of political commentary?
Calm down...here watch...check it out.
+5>+2
+2 +5
What symbol would you use here? How about you young man...wanna give it a shot?
Sure..I remember that!
+5>+2
+2<+5
We reverse the symbol because +2 "is less than" +5.
I always confuse the < and > symbols. Then again, I can never remember which Gabor sister starred on "Green Acres." ZsaZsa or Eva?
It was Eva! ZsaZsa's never starred in anything! But back to those symbols. Here's how I remember them. > is on the right of the number line and numbers on the right are bigger. < is on the left of the number line and numbers on the left are smaller.
Not bad...I remember < because it looks like an L. See...
LESS


Hey...how about another problem Professor?
Sure...which symbol, < or >, would you use between **these** numbers?
-4 -2
-4 is **greater** than -2.
No...wait! -4 is **less** than -2!
One of you is right. Young lady, come up to the board and fill in the proper symbol.
Less than because -4 is to the **left** of -2!
-4<-2
Yo...wait a second! Isn't 4 **bigger** than 2?
Yes...but remember to watch those **signs**. -4 is less than -2!
-4<-2
Our friend here ignored the signs. That's interesting because sometimes we **aren't** concerned about the signs.
Sounds like my last road test Professor Weissman. (he he)
When you're **not** concerned about the signs...isn't that called **absolute value**?
Absitively! Here, check out my handy dandy diagram.


Now...if you're low on gas and want to get to town fast, which way would you go?
WEST
GAS 8 MILES
EAST
GAS 3 MILES
I don't know about anybody else, but **I'd** grab my siphon and find the nearest parked car.
You'd go to the right. It's only 3 miles. To the left it's 8 miles.
Of course...-8 is less than +3 but you don't care about the direction or the sign...just the magnitude or the **absolute value**.
-WEST 8 +EAST 3
-8 < +3
|-8| > |+3|
8 > 3
So those vertical lines mean **absolute value?** Sort of "drop the sign?"
As my wife said when she pulled the car out of the garage, "I **think** I'm making a dent!"
As we see...numbers in Algebra have **two** parts. A sign and a magnitude or "absolute value."
SIGN
MAGNITUDE
The sign shows direction and the magnitude tells us **"how much."** Has anybody here used signed numbers lately in their everyday lives?
My wife Mildred wrote a check yesterday for 350 dollars...look at this entry.

Exercise Set 5

1a. Locate these numbers on a number line: -5 and +3

b. Circle the larger number

c. Write 2 inequalities showing the relationship.

2. On the number line, which number is

a. 3 units to the right of +1

b. 3 units to the left of +1

3. On the number line, which number is

a. 3 units to the right of -2

b. 3 units to the left of –2

4. Put the correct inequality symbol < or > between the numbers.

a. +3 +8

b. +3 -8

c. -3 -8

d. -3 +8

e. -7 0

f. 0 +5

g. 0 -6

h. -99 +6

5. Arrange the numbers from smallest to largest

a. -5, 7, 0, 3

b. 7, -6, -11,-7

c. 0, -7, 7

d. 8, 0, -8

6. What is the opposite of

a. -6

b. 5

c. -7

d. +12

e. 0

f. x

g. -m

7. Simplify

a. - (- 6)

b. - (+ 8)

c. - (25)

d. - (0)

e. + (- 7)

f. + (+35)

g. + (22)

h. + (0)

8. Simplify

a. |-11|

b. |+9|

c. |8|

d. |0|

e. - |-35|

f. - (-35)

9. Insert the correct symbol <, =, or >, between the numbers.

a. |5| ___ |7|

b. |-5| ___ |-7|

c. |-12| ____ |8|

d. -12 ____ +8

e. |-6| ____ |0|

f. |-4| ____ |+4|

g. -4 ____ +4

10. Simplify each number then arrange in order from smallest.

a. |-5|, -6, -(-4), |3|

b. -(+2), |-7|, 0, |-3|

c. 0, +(-5), - (+8), -|-9|

d. |-10|, - (-9), +|7|, -6

Jokes Set #5

New York (CNN). At John F. Kennedy International Airport today, a Caucasian male (later discovered to be a high school mathematics teacher) was arrested trying to board a flight while in possession of a compass, a ruler, a protractor and a graphical calculator.

According to law enforcement officials, he is believed to have ties to the Al-Gebra network. He will be charged with carrying weapons of math instruction.

It is only two weeks into the term that, in an Algebra class, a student raises his hand and asks: "Will we ever need this stuff in real life?"
The professor gently smiles at him and says: "Of course not - if your real life will consist of flipping hamburgers at MacDonald's!"

Math problems? Call 1-800-[(10x)(13j)²]-[sin(xy)/2.362x].

George W. Bush visits Algeria. As part of his program, he delivers a speech to the Algerian people: "You know, I regret that I have to give this speech in English. I would very much prefer to talk to you in your own language. But unfortunately, I was never good at algebra..."

The Romans didn't find algebra very challenging, because X was always 10.

SMART STUDENT: I'm taking French, Spanish, and Algebra this year.
LESS SMART STUDENT: Okay. Let me hear you say "good evening" in Algebra

STUDENT: But I don't think I deserve a zero on this exam.
TEACHER: Neither do I, but it's the lowest mark I can give you.

Brain Teaser Set #5

1. What happened in 1961, that will not happen again until 6009?

2. Complete the magic square with the missing integers 2,4,5,8 so that all three columns and all three rows and BOTH diagonals sum to 15.

	7	6
9		1
	3	

Answers to Exercise Set 5

1a.

b. +3

c. -5<+3 and +3>-5

2a. +4

b. -2

3a. +1

b. -5

4a. <

b. >

c. >

d. <

e. <

f. >

g. <

h. <

5a. -5,0,3,7

b. -11,-7-6,7

c. -7,0,7

d. -8,0,8

6a. +6

b. -5

c. +7

d. -12

e. 0

f. -x

g. +m

7a. +6

b. -8

c. -25

d. 0

e. -7

f. +35

g. +22

h. 0

8a. +11

b. +9

c. +8

d. 0

e. -35

f. +35

9a. <

b. <

c. >

d. <

e. >

f. =

g. <

10a. -6,3,4,5

b. -2,0,3,7

c. -9,-8,-5,0

d. -6,7,9,10

Brain Teaser #5

1. The numbers of the year 1961 read the same if you rotated it 180 degrees (turn it upside down). This will not happen again until 6009.

2 7 6

9 5 1

4 3 8